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NOTES

ON THE

SHROPSHIRE COAL FIELD

BY

T. PARTON, F.G.S.

103

ENTERED AT STATIONER'S HALL

LONDON:

Printed & Published by W. M. Hutchings, "Colliery Guardian" Office, 5 Bouverie St, Fleet St, E.C.

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NOTES ON THE
SHROPSHIRE COAL-FIELD.

CHAPTER 1.—Introductory.

In this and following chapters I purpose giving geological and mining details of parts of the above coal-field. Although it is not renowned for its extensiveness, or world-famed for a "ten-yard coal," it forms not an unimportant part in the great fabric of England's industry. It contains within its own boundaries, and around it, many interesting peculiarities worthy the attention of the geologist and mining engineer. The former will find formations of different strata; beautiful sections exposed to view along the Severn valley; faults and dykes, and effects of denudation. The latter will have interest in the varied character of its seams of coal and bands of ironstone. He will find matter for puzzling his ingenuity in arranging his winning to advantage where so many minor and large faults dislocate the seams. Another difficulty will afford him material for thought in determining the best mode of working the coals and ironstone when they lie in such close proximity to each other. Such are the materials with which we have to deal in the development of this subject.

Before we enter into details of sections, &c., it will be advisable to give a brief outline of the position and extent of this coal-field.

As we examine the part coloured dark on the ordnance map before us, we notice that its shape is something of a triangle, of which a sharp angle terminates near Newport. The other extremity reaches as far as the neighbourhood of Broseley. It may be considered about 12 miles in length, and from 4 to 5 miles in breadth. Along its western edge the coal or carboniferous strata outcrop, resting on older rocks; the eastern limit is caused by the permian and new red sandstone formations. It is supposed to have been proved extending underneath the permian sandstone by the Lilleshall Company, but as yet we cannot hear of any main fault having been wrought abutting or facing the new red formation. The carboniferous limestone forms the base of the coal-field, appearing in great thickness at Lilleshall, but entirely thins out as it approaches the southern extremity of the coal-field, where the coal measures rest directly upon silurian rocks. A strange feature in connection with this field is, that all the seams of coal and ironstone become thinner and very much diminished as they are proved southwards. To give our readers an idea of this on a *prima facie* view before entering upon details, we here state the thicknesses from actual proof and measurement of the coal in various parts of the coal-field. Thus we find the total thickness of the coals are, at Donnington, near Newport, 55 feet; at Lightmoor, 40; Malin's Lee, 35, and at Amies, near Broseley, 16 feet. The ironstones also diminish in a similar way, being 7 in number, and about 70 feet thick near Newport; at Lightmoor, 3 measures in number, and 24 feet thick; and at Broseley being only 2 measures, 8 feet thick.

The most important fault is termed the "Great Lightmoor Fault," being an upthrow north of about 130 yards. Its direction is N.N.E. In speaking of faulty ground or barren measures, the Salopians use the term "Symony ground," and a "Symon fault," which term we shall use as we refer to such. We shall, by the aid of sections, be able to explain the reason of the thinning of these coals and ironstones, showing the part that denudation has played in thus diminishing apparently the value of this coal-field.

The question is now before the public as to whether or not there is any probability of this coal-field having any connection with the South Staffordshire coal-field. Looking geologically at the matter, there is every reason to suppose that at some depth the coal measures exist underneath the new red sandstone that lies between the two coal-fields. As in Staffordshire the coal measures have been found to exist underneath the permian formation, so it has in Shropshire. Some gentlemen have gone so far as to draw imaginary sections showing the connection of the two coal-fields before the dislocations. We may in the course of our investigation do a similar thing, but doubtless in a few years we shall prevail upon somebody to prove this beyond doubt. When we consider the present limits of this coal-field, and the long time it has been pouring out its treasures, this question of extension becomes of no ordinary importance. According to the latest statistics of Mr. Hunt, F.G.S., we find that Shropshire boasts of 63 collieries, and produced 1,220,700 tons of coal in the year 1866. Its produce of ironstone for the same year amounted to 285,907 tons. The make of pig iron, with about 23 furnaces in blast, was 121,161 tons.

CHAPTER II.—Its Coal and Ironstone.

From examination of various sections taken in different parts of the coal-field, we may assume the whole of the coal measures to have an average thickness of 1,000 or 1,100 feet, consisting of 70 to 90 distinct strata. The measures are composed of sandstones, shales, coals, ironstones, and sometimes calcareous seams. We particularly notice that the upper part of the strata is peculiarly devoid of productive coals or ironstones, while the lower part is crowded with both. This latter feature is not the most favourable for mining, as we shall show in a subsequent chapter to be devoted to this part of our subject.

The following list will give the reader an idea of the workable coals and ironstones in descending order, occurring within a vertical space of about 170 feet. (See Fig. 1.)

	Thickness of					
	Coals.		Ironstones.			
	ft.	in.	ft.	in.	ft.	in.
1. TOP COAL (very valuable) ...	4	6				
2. HALF YARD COAL .... (not valuable)	1	6				
3. DOUBLE COAL (much used)	6	0				
a. Yellow Ironstone .... (not very profitable)			5	6		
4. YARD COAL (sometimes got)	2	9				
b. Blue Flatt Ironstone .... (rich in quality)			6	0		
c. White Flatt Ironstone (poor)			4	0		
5. BIG FLINT COAL............... (good burning coal)	3	0				
d. Penny Ironstone measure ...... (valuable)			20	0 to	24	0
6. STINKING COAL (inferior) ...	4	0				
7. TWO FEET COAL............... (sometimes worked)	2	0				
8. BEST COAL (good)	2	0				
9. RANDLE COAL (good)	3	0				
10. CLOD COAL .... (good smelting coal)	1	4				
11. LITTLE FLINT COAL .... (good smelting coal)	2	0				
	32	1				

As we stated in our first chapter, the coals in the northern part of the coal-field reach a total thickness of 55 feet; but the above being taken from a section in the centre of the field will show the average, nearly. The ironstones that are considered of value are the Blue Flatt, and Penny. The Yellow and White Flat ironstones are got in parts of the coal-field, but their quality is far inferior to the other two named.

CHARACTER OF THE COALS AND IRONSTONE.—The coal underlying the Penny stone, called the *Stinking Coal*, is noted for containing a great proportion of sulphuret of iron. In consequence of this it cannot be used for smelting purposes. We have noticed thick seams or layers of these pyrites running in the coal. The Top, Double, Yard and Big Flint coals are good for manufacturing purposes. Occasionally some of them are coked, and used in the furnaces, but furnace managers, who are often more nice than wise, would rather do without them so long as they can get the famous Clod coal and Little Flint. Mr. Prestwich, in his volume, states that the latter coal could not be used in furnaces on account of its inferiority. This is not the case now. In the centre of the coal-field, at Malin's Lee, and Lilleshall Company's works, near Oakengate, this coal is now much used for smelting. In this, as other districts, prejudice has had and still has much to do with the supposed suitability of certain coals for certain purposes. We might mention that in many instances a change has come over the dreams of furnace managers. Coals which were condemned to all intents and purposes twenty, yea ten years ago, are now being applied for iron smelting successfully. It has been quite the ruling habit of managers devoid of a particle of scientific knowledge to screen their failing empirical systems by attaching all the blame to the inferiority or sulphurousness of the coals. We are pleased to assert that Shropshire is alive to the importance of throwing off the old shackles of empiricism, and superseding them by the adoption of scientific improvements.

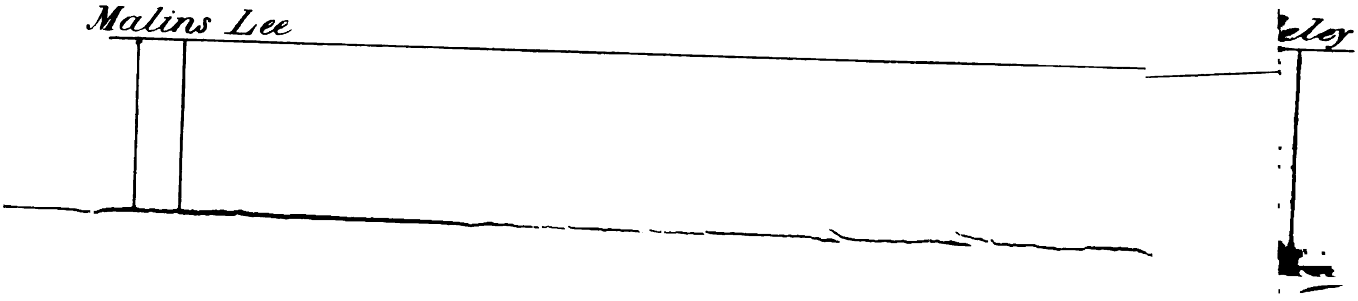
IRONSTONES.—The Penny stone is the most remarkable and the most productive ironstone in Shropshire. It is composed of a series of nodules producing from 2,000 to 2,600 tons to the acre. This measure, like the others, greatly thins out towards the southern part of the field. According to the analysis given by J. Piller, F.G.S., and the practical proof in smelting, this ironstone contains about 35 per cent. of iron. The cavities of these nodules are filled up with sulphate of baryta, silicate of alumina, carbonate of lime, and crystals of zinc-blende. A curious feature in connection with this seam is the presence of petroleum. In certain parts the work appears as though it had undergone a washing of tar. We understand that at one time petroleum abounded in the coal measures, producing as much as 1,000 gallons per week.

THE BLACK STONE AND BLUE FLATTS are rich and valuable ironstones. These stones occur in nodules, and produce from 1,000 to 1,600 tons per acre, and are worth from 15s. to 16s. per ton, being the same value as the Penny. These stones are costing from 6s. to 11s. per ton to get. The famous cold blast iron of the Lilleshall Company is made from equal mixtures of Black stone, Blue Flatts and Penny stone, with a little proportion of others.

As I have previously stated, the other ironstones in the section are, as a rule, inferior to those just enumerated, and need no special comment.

As we shall show in a subsequent chapter, the coals and ironstones are not persistent throughout the field. The Little Flint and Clod coals are the most continuous, not being affected by the *faults* and *symony* ground so much as the others. The following section is taken from a sinking in the Old Park Colliery near Oakengates, and will give the details of strata in this part of field.

Section of Pudley Hill Pits.	Thickness of Strata.			Thickness to Coal.		
	yds.	ft.	in.	yds.	ft.	in.
Soil	0	0	8			
Clay	1	1	0			
Loose Rock	1	2	0			
COAL	0	1	0	3	1	8
Blue Clod	4	0	0			
Red Clunch	3	0	0			
Top Rock	8	0	0			
White Clod	3	0	0			
Brown Clunch	5	0	0			
Red and Blue Clod ...	3	1	0			
White Binds...........	4	2	0			
Carried forward ...	34	1	8			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Section of Pudley Hill Pits.	Thickness of Strata. yds.	ft.	in.	Thickness to Coal. yds.	ft.	in.
Brought forward...	34	1	8			
Blue Clod	7	0	0			
Brown Clunch	4	1	0			
Red and Blue Clod ...	4	0	0			
Blue Clod	7	0	0			
Thick Rock	17	0	0			
Strong Blue Clod......	16	0	0			
Stinking Rock	16	1	0			
COAL	0	1	9			
Rock	0	1	6			
COAL	0	0	9			
Fire Clay	0	2	0			
COAL	0	1	0	109	0	8
Strong Binds	6	0	0			
White Rock	18	0	0			
Red Clod	1	2	0			
Brickman's Measure...	8	2	0			
Rough Rock	17	0	0			
Rough Binds	6	0	6			
Dark Clod	3	2	6			
Dark Rock...............	8	2	0			
Rock Binds	5	0	0			
Strong Clod	4	1	6			
Blind Bass	1	0	0			
Ballstone Clod	5	0	0			
TOP COAL	1	1	6	191	0	8
Bass	0	1	0			
Slaty Measure	4	1	6			
½ Yard Coal	0	1	6			
Double Coal Rock......	2	0	0			
DOUBLE COAL	2	0	0	201	1	8
Yellow Stone Clod ...	1	2	6			
YARD COAL	0	2	9			
Parting	0	1	6			
Blue Flat Clod	1	2	6			
Pitch of Casses.........	1	2	0			
White Flat Clod	3	1	9			
BIG FLINT COAL......	1	0	0	211	2	8
Flint Rock	7	2	0			
Penny Stone Clod ...	6	2	0			
STINKING COAL	1	1	0			
Upper Clunches	9	0	0			
SILK OR CLUNCH COAL	0	2	0			
Clunches	0	2	6			
TWO FOOT AND BEST COALS	1	1	4			
RANDLE& CLOD COALS	1	1	8	240	1	2
Little Flint Rock......	4	0	0			
LITTLE FLINT COAL	0	1	6			
	244	2	8	244	2	8

The above section contains all the coals and ironstones that peculiarly characterise the Shropshire coal-field with the exception of what is found in the Madeley sections, which we here add in succeeding order.

	yds.	ft.	in.	
Little Flint Rock	3	1	0	
Crawstone Measure ...	1	0	0	
COAL	0	1	0	
Crawstone Crust	1	2	7	
Lancashire Ladies COAL	0	0	9	Not worked.
Rock, hard...............	0	2	0	
do.	1	0	0	

Wenlock Limestone underlies this at Lincoln Hill.

There is the "Fungus Coal," which is chiefly confined to the north of the field, and is good for nearly every purpose.

Mr. Prestwich gives the following analysis of the various coals, which is of great interest.

Name and locality.	100 parts of coal consist of Volatile substances	Carbon.	Ashes.	Sp. gra.
FUNGUS COAL, (Donnington)	34·8	63·8	1·4	1·245
TOP COAL, Donnington	37·1	62·1	0·8	1·267
FLINT COAL, Madeley ...	34·6	64·9	0·5	1·269
SULPHUR COAL............ (Ketley)	41·1	56·1	2·8	1·292
BEST COAL, Madeley ...	34·3	64·4	1·3	1·273
CLOD COAL, do. ...	37·3	62·7	1·0	1·264
LITTLE FLINT COAL ... (Broseley)	38·3	61·1	0·9	(not given)

CHAPTER III.

THE "GREAT SYMON" AND OTHER FAULTS.

No coal-field that we are aware of is void of its faults and lines of disturbance. The Shropshire field is by no means an exception. It rather possesses more than its share, for it is shattered in all directions by extensive and minor faults. The very term "fault" signifies the existence of something objectionable, and we too frequently use the term as implying that a coal-field is much deteriorated in consequence; whereas, in innumerable instances, they are the greatest boons, by forming barriers against the influx of water, or by bringing coals and ironstones, otherwise inaccessible without enormous outlays, on a level with workings already accessible. The accompanying section (Fig. 2) will illustrate what we mean.

A represents a coal free from water and being worked. B also represents a coal, but at a greater depth than A, and is under the level of drainage. In course of working the seam A, a fault, C, is met with. It is an upthrow to the east, and just enough to bring the coal B on a level with the workings in seam A. Of course it ofttimes has the reverse effect, but any practical mining engineer will admit that faults have many advantages.

The principal faults that traverse the field are the Ketley, producing a change of level between 500 and 600 feet in one part; the Lightmoor fault, having a dislocation equal to 300 feet at Snedshill, at Malin's Lee 700 feet, at Dawley Green 450 feet, and at Lightmoor 300 feet. Besides these, innumerable minor faults or "slips" and "slikensides," as they term them, are met with; and it is these minor ones that trouble and inconvenience the miner more than the extensive ones, for they disjoint the coal into small pieces, and shatter the roof, necessitating more care and an excess of timber in working.

It is a singular feature, not only in this coal-field, but in most others, Staffordshire especially, that these faults do not modify the surface. Not a trace can be found save in the various rocks and shales which they bring to the surface. Denudation has swept away the irregularities to a great extent, and what variation we do find in the surface, is owing to the character of the sandstone or shale.

But there is the "Great Symon fault" running through the district, which is not the same in character as the faults we have been referring to. While reporting upon an extensive colliery in the district, I was puzzled to know what was meant by this "Symony ground" or "Symon fault" and a deposit of "calaminca." I asked if it was a fracture or dislocation? No, it was neither, but a "something that took the place of the coal, throwing them out one by one, and that it went through the field zig-zag, like the course of a stream." Not being able to understand it, I made an examination of it in several pits, and I found that it had the appearance of an estuary or old valley of denudation subsequent to the formation of the coal measures, and the space denuded again filled up by shales and deposits evidently belonging to the coal formation, and these of course unconformable to the regular coal seams on either side. The accompanying section 2, will give some idea of this peculiar fault; though, strictly speaking, according to Jukes, it is no fault. Between the two points A and A *a*, several pits are sunk through the new deposit, proving the gradual disappearance of the coals and ironstones. The "Grange Pits," in the Old Park Company's Colliery at Stirchley would be represented on the section at E, where only the Clunch, Two Foot, Clod, and Little Flint coal are found. A short distance from the shafts the "Symon ground" cuts off even the Little Flints. (See F on section.) The width of this estuary is not actually proved, but we believe that pits at Madeley and the Stafford pits are over it, in the coals, and these have penetrated through the coals, meeting with the calaminca, *i. e.*, a sort of red shale or "*Symon*," see B. The appearance of the coals against the limit of this ground is rather peculiar—rough jagged edges and crevices or fractures filled with sandstone. The accompanying sketch (Fig. 3) will illustrate this.

The appearance of section 2 would give the reader the idea that this break in the coal measures by the denuded valley is well defined, but this is not so. The strata composing or filling up the supposed estuary has been fractured and dislocated by the many faults, and it is only by a close and accurate examination of shaft sections that the inference of its being an estuary can be made. Marcus W. T. Scott, Esq., F.G.S., has given many details of this fault in a paper read before the Geological Society. Having professional business in the same part of the coal-field, I have carefully compared notes and sections with his and find them reliable. Before knowing that that gentleman had been over the same ground of inquiry, I had come to the conclusion that he had as to the character and origin of this peculiar fault. I had the pleasure of meeting with Mr. Scott in the district, and was much interested in discussing the question with him.

According to section B of shaft at Madeley, the coals are not in their relative position. But such is their character, that they can, although rather altered in thickness and position, be identified as the regular coals. We have, in other coal-fields, similar instances of coals splitting up.

I have drawn the coals direct to unexplored ground on plan to give my readers an idea as to the nature of the Symon fault. Necessarily part of the section is hypothetical.

REFERENCE.

A. Shaft at Malin's Lee.
B. Shaft at Madeley.
C. Calaminca, *i. e.* "a mixture of red and yellow clay, marl and sand."
D. The estuary filled up by coal measures.
D 2. Unexplored ground.
E. Represents a shaft at Stirchley.
F. Spot where the Little Flint Coal is denuded.

CHAPTER IV.—IGNEOUS ROCKS AND DYKES.

THE readers of the third chapter, on "faults, &c.," will expect to hear that, in a district so cut up and so fractured, a kindred trouble, in the shape of protrusions of igneous trap rock, exists in large quantities. But, unlike the Staffordshire coal-field, which in this respect is the most interesting in the country to the mineralogical student, Shropshire offers but a meagre cabinet within the boundaries of its coal-field. Outside we do, however, find the igneous rocks in interesting positions. Everybody has heard of the Salopian pride in the possession of the long knife-edged mountain,—the *Wrekin*, which boasts of being about 1,300 feet above the level of the sea. It consists of a hard, reddish grey hornstone. Adjoining this hill we notice the lesser one called the *Ercal*. The rocks forming this are somewhat different to those building up the Wrekin. The Ercal is composed of feldspar, porphyry or enrite, light flesh-coloured feldspar, with small quantities of quartz and crystals of common feldspar. In all our researches in its many quarries we cannot detect the rocks assuming the columnar structure. The well-known hard porphyritic greenstone is plentiful.

Another outcrop of igneous rocks is observable in a direction S.S.W. and N.N.E. from the "Spout" to "Steerways."* This consists of the fine-grained greenstone. Near Ketley the coal measures rest upon trap rock. This, though, is not now visible. An old miner living in the neighbourhood corroborates the statement that this was proved in the driving of a water level from the Old Park to Ketley.

In the coal-field generally we do not find any of this rock worthy of mention. Years ago, when the mine was

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* See Prestwich.

STRATA.

FIG. 5.

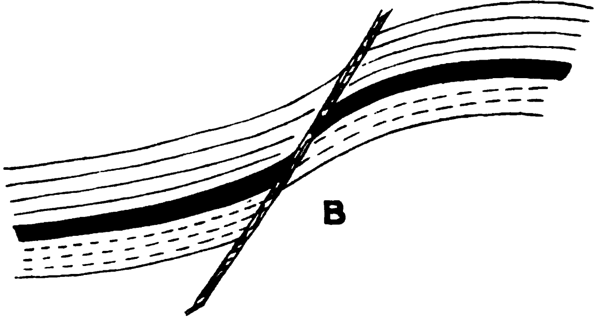
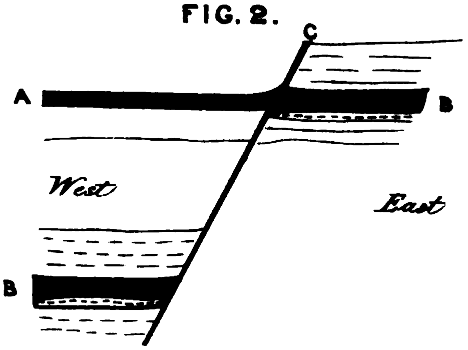


FIG. 2.



worked near the outcrop, this basalt was often met with, but in those days they had no notion of recording such, and we can only rely upon the tales of workmen. At the end of the coal-field, we get a last glimpse of this rock in the formation of the Lilleshall Hill.

Dykes.—At the present time we cannot report anything of sections through *igneous dykes*, but we can of dykes formed by faults which have but little inclination. It is not often we observe a vertical dislocation. It is well known to those acquainted with mining that, as a rule, faults are either "upthrows" or "downthrows;" this being known by the inclination of the "slip" or "side of fault." But sometimes the side is vertical. So it is with respect to the Lilleshall Fault. In the Old Park, Malin's Lee, the fault does not "hade," but it is, as the colliers say, "upright." When this is the case we get a dyke, *i. e.* a fracture, between the two sides of fault filled up by foreign matter such as shales, pieces of ironstone, fire-clay, &c., intermingled together. The distance through this dyke is in places from 100 to 200 yards, and in this fracture the coals are often found edgeways. A curious feature in connection with faults is that the coals and strata, as they lie near a fault that "upthrows," *i. e.* that "hades" from them, dip, and *vice versa*. It is so with respect to the coals lying against some of the faults in the Shropshire coal-field. The accompanying section A (Fig. 4), will give an idea of this.

Perhaps the most general position of beds lying against faults would be according to section B, (Fig. 5) though by no means invariably. In Fig. 5, *a* is a dyke filled by broken coal measures.

CHAPTER V.—Methods of Working, Cost, &c.

Each of our coal-fields has a method of getting its minerals peculiar in some respects to itself. This is occasioned by the various positions and the character of the coals and ironstone, and the nature of the strata over and underlying. Independent of these important considerations, mining engineers have, like other men, whims of their own. One will cling to a system, and try to apply it, in spite of circumstances unfavourable for its application. Another will adopt a method in spite of failure. Hence we hear so much of the "square work," the "pillar and stall," the "bord and pillar," and the "long-wall" systems. The method adopted in the Shropshire coal-field is known by the "long-wall." This appears to be the favourite system now, and in many instances is being applied as superseding others in the various coal-fields of Great Britain.

Much has been reported respecting the lax system of working the mines in the "Black Country," but we fail to observe any superiority in the systems of the Salopians. The mines of the latter, like the former, are worked by "charter-masters," or "butties," who agree with the proprietors to raise the minerals on to bank at so much per ton, or per dozen, the latter applying to the ironstones, representing about two tons. We cannot agree with all the denouncements against this system, neither do we favour it exclusively as being superior to any other. The merits of such a system depend upon the ability and moral character of these "contractors."

Several of the large collieries, extending over several thousand acres, are dragging on with a style of fifty years ago. The engines are not capable of raising more than from 6 to 10 "*droughts*," or loads, per hour, whereas the peculiar position of the seams of coals and ironstones would, with good management in the opening, supply double that quantity. At the same time, we must give those companies who are fixing plants of a superior kind credit for abolishing the slow and, in the long run, expensive systems, for modern ones. The Lilleshall Company is doing much that is highly creditable in this respect, and can boast of plants for coal winning equal to most in the country.

It is a difficult matter, where the seams lie so close to each other, to avoid injuring very materially some of the coals. In this respect, this coal-field is peculiarly unfavourable. Yet in this case, as in all others, advantages and disadvantages go together. This circumstance of the close proximity of the seams has its advantages, which may be turned to good account by a shrewd and thoughtful manager. The advantage is this. Supposing the seam B on section (fig. 6) was being worked in the usual way, by commencing at a safe distance from shafts to open in the coal, breasting the face work towards the boundary, carrying what is termed "gob gate-roads." After extracting the coal to *b*, the same roads would answer for bringing out the coal A, in this case working from C towards shafts, the reverse way of the other. In a case of this kind, they "blow the road down" till it reaches the coal, when they commence to open work, jigging the coals down the incline shown by the dotted line, into the roads that were formed in getting coal B. Again, in working out the coal D, they would make the same "gate-roads" answer for getting the ironstone F and G, by continually "blowing-in the roads." At other times, and this very frequently, the numerous faults bring with them the advantage of facing coals and ironstones, without the expense of driving roads on purpose. In a pit coming under the writer's supervision, the Blue Flatts ironstone is being worked, and in doing so a fault or dislocation has been met with. This fault brought the *Blue Flatt* ironstone to face, or on a level with, the Big Flint coal. (See sketch, fig. 7.) The result is that the same pit is getting the ironstone on the one side the fault, and the coal on the other.

But, as I have before stated, the disadvantage of the peculiar position of the seams of coal and ironstone is, that it is impossible to work out the measures without materially crushing each other. And as the ironworks require a mixture of ironstone for producing the varied classes of iron, they often commence the extraction of such without considering its effect upon certain coals lying in close proximity. Much judgment is therefore requisite in the laying out of workings; and it behoves the managers who have the responsibility of the collieries to see that this particular is attended to.

PRODUCE.—Previous writers on the question of produce have supposed the following table to give a fair calculation of tons per acre:—

	Tons per acre.
Coals	26,620
Lumps	5,324
Slack	7,986
Ironstone	13,794

But, as we have shown that the coals are by no means regular and persistent throughout the coal-field, a calculation taken from experiment in one particular part is no correct standard for any other, under dissimilar circumstances.

COST.—The cost of extracting the coals and ironstone also varies according to circumstances of each case, but the calculations given as follow are as near as we can apply:—

			s. d.		s. d.	
Top Coal, delivered on to bank,		from	3 0	to	4 0	per ton.
Double Coal	„	„	2 6	„	3 0	„
Yard Coal	„	„	3 6	„	4 6	„
Blue Flatt Ironstone		„	7 0	„	10 0	„
White Flatt „	„	„	9 0	„	11 0	„
Big Flint Coal	„	„	3 0	„	3 6	„
Penny Stone	„	„	6 0	„	9 0	„
Stinking Coal	„	„	3 0	„	4 0	„
Two Foot and Best Coal		„	3 0	„	4 3	„
Randle Coal	„	„	3 0	„	3 6	„
Clod Coal	„	„	3 0	„	4 0	„
Little Flint	„	„	4 6	„	6 0	„

The above table contains about the minimum and maximum of prices for getting the coals and ironstones. These, of course, rise or fall according to the rate of wages.

CHAPTER VI.—ORGANIC REMAINS.

THE Shropshire, or, as it is often called, "Coalbrooke Dale" field, is proverbial for its fossil remains, forming as it does a perfect museum, rich and remarkably interesting. No coal-field has given the geological student more interest than this, in its means for supplying specimens of things that once lived and flourished; and no coal-field has been more closely and minutely examined, thanks to Mr. Prestwich, in respect to the classification of its abundant flora. We here find alternations of beds containing marine and fresh water exuviæ. Mr. Phillips supposes this fact to indicate a periodical return of the marine element into its ancient receptacle, after it had been for some time occupied by fresh water. Mr. Prestwich, however, thinks, and we are inclined to believe in the same theory, that the measures of this coal-field were deposited in an estuary, into which flowed a great river; that the latter, during periods of tranquillity, carried down the silt forming the present beds of shale, enclosing at the same time the marine inhabitants of the estuary; and that during floods the river drifted along vast quantities of uprooted plants with fluviatile shells, and thus accumulated those strata, principally of sandstone, which are characterised by terrestrial or fresh water remains. As we cannot pretend, in these papers, to enter fully into these matters at this time, we purpose giving a brief list of the fossil remains, as classified by Mr. Prestwich, as we cannot classify them better. From observation, we can speak as to the accuracy of his research. We also recommend his principle of classification to others. It is valuable in determining or recognising the various shales, sandstones, &c., by the presence of prevailing fossil remains.

Commencing at the lower part of section, we find in the "Crawstone sandstone" numerous casts and impressions of the Stigmaria Ficoides, Calamites, and Sigillaria. In this sandstone the "Crawstone ironstone" occurs, in which has been found the *Unio* or *Anthracosia*.

Above this we reach the Little Flint coal, which has imbedded in it the stems of Stigmaria composed of sandstone. The rock overlying this also contains similar specimens.

The shale and fire-clay separating the Clod and Randle coal are surprisingly full of vegetable impressions, lying in all conceivable directions—Calamites, Stigmaria, Sigillaria, Lepidodendra, Sphenopteris.

The Penny Stone is interesting with its appearance and evidence of the piercing by burrowing worms, which have left, as a writer says, "heaps of excretions at the doors of their dwellings." This ironstone contains numerous marine organic remains, the characteristic marine fossil being the *Leptæna Scabicula*, occurring also in the mountain limestone. Several species of Nautilus, Bellerophon, Orbicula, Unio, Terebratula, Lingula, &c., associated with the bones and scales of the *Megalichthys Hibberti*, and the *Gyracanthus Formosus*.

Another characteristic fossil is the *Orbicula Reflexa*.

Above the Penny Stone succeeds a fine grained sandstone. This contains abundance of land plants, such as Calamites, Stigmaria, Sigillaria, &c.

Big Flint Coal is not proverbial for any characteristic fossil, but the White Flatt Ironstone contains some very interesting ones, the characteristic plants being Lycopodiaceæ and Equisetaceæ. Associated with these are considerable quantities of Unio, scales and bones of *Megalichthys Hibberti*, and *Gyracanthus Formosus*. Also, most singular fossils of undescribed Crustacea of the Trilobite family.

Immediately above this lies the Blue Flatt measure. The ironstone, which occurs in nodules of all imaginable shapes, is full of the fossil *Unio* or *Anthracosia*, and impressions of the vegetable Lycopodiaceæ.

The Yard and Top Coals contain specimens of the Calamite, the Stigmaria, Sigillaria, and several genera of the Lycopodiaceæ.

The only stratum above that contains more than ordinary interest is the Chance Penny Stone, being the highest bed of ironstone in the coal-field. After the preponderance of vegetable remains in all the lower measures, we here discover a change in the shape of a great abundance of *Leptæna Scabicula*. This fossil, we believe, has only been found in the Penny ironstones. This fossil also, in many instances, forms the nucleus for the nodules of ironstone.

SECTIONS, GIVING PARTICULA

Amies, near Broseley.

Name of Coals.	yds.	ft.	in.
From surface to Coal	94	0	10
Sulphur Coal	0	2	6
* Strata	29	1	6
Best Coal	1	0	4
Middle Coal	1	0	0
Clod Coal	0	1	8
Strata	3	0	3
Little Flint Coal	1	0	0
	131	1	1

Madeley Meadow Pit.

Name of Coals.	yds.	ft.	in.
To top of Coal	161	1	10
Rider Coal	1	1	0
Strata	23	1	1
(No name) Coal	0	2	10
Strata	4	0	0
Bottom Coal	1	0	0
Strata	4	1	4
„	3	1	9
Sulphur Coal	0	1	4
Strata	3	1	2
Coal	0	1	3
Strata	6	2	5
Coal	0	1	3
Stratum	0	0	8
Upper Gainey Coal	1	2	2
Little Gainey Coal	0	0	6
Lower „	2	0	2
Stratum	0	0	6
Main Gainey Coal	0	1	3
Strata	6	0	1
Best Coal	0	2	8
Strata	2	2	0
Clod Coal	0	1	10
Strata	5	1	6
Little Flint Coal	1	0	4
	233	0	11

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* Strata in these sections will represent the intermediate shales and rocks, &c.

nother characteristic of this Penny Stone is the presence of *egalichthys Hibberti, Gyracanthus Formosus* and *Conulenia.*

The fossils that are found imbedded in the ironstones re, on the whole, well preserved, the substance of the impression being a thin film of coaly matter. The shells of the Penny Stone are all ironstone casts. The Stigmaria and Sigillaria have a matrix of sandstone with a thin coating of coal as a bark.

These fossils do not exist regularly throughout the coal-field: for instance, the common shell *Unio,* though preponderating in the centre of the field, is scarcely found at Madeley and Broseley. The Stigmaria Ficoides are found throughout the district.

CHAPTER VII.—General Remarks and List of Sections.

Although the above coal-field has not attained to the high standard of popularity and economic importance which characterises others, yet the few facts and figures which have been given in the course of these chapters prove that it still is of national value, and cannot well be overlooked. Every "black country," no matter how comparatively insignificant it may appear, possesses peculiarities and interest not boasted of by any other. In our study, therefore, of these "plutonic regions," we are sure to get rewarded by increasing our stores of scientific knowledge, learning something new with respect to position and character of coals and ironstone, and the general structure of a coal-field. For this reason the "dry facts," as some would term them, which we record, become of immense importance in our deductions and inferences with respect to the scientific questions of "how?" "when?" and "where?"

In these chapters, we have briefly paid attention to the general structure of the coal-field, its coals and ironstones, and their value, its faults and fractures, its igneous rocks and disturbances, its modes of getting the said minerals, with sections, and also a chapter for the student of palæontology.

We have not attempted to go into every detail, as our space would not allow of such, but have condensed our topic into a space sufficient to give such details as would interest all connected with mines and mining.

Before concluding with sections from which the plate is illustrated, it may be interesting to some to hear a little about the great discoveries of coal supposed to have been found by the indefatigable energies of the Lilleshall Company. Newspapers have reported that the discovery of coal is over the fault limiting the old coal-field, as marked on the ordnance map, and that an indefinite amount of coals and ironstones are found under the permian formation. Having made inquiries into the circumstances of the sinking of the pits referred to, I am told, on the best authority, that neither at the new Stafford pits, nor the Grange pits, have the sinkings passed through the permian sandstones. Certainly, faults have been met with, but not the sandstone fault dividing the immense tract of country towards Wolverhampton and district from the Shropshire coal-field. I am also informed that the faults, as marked on the ordnance map, are not accurate. It is very possible to lay down a line on a plan, the scale of which is one inch to the mile, and be wrong as to position. This only shows us the importance of increasing the scale and size of such maps. In certain districts we hear of this being done, and the advantages of it are greatly enhanced.

Although we are not as yet satisfied as to the existence of a coal-field under the sandstone between Staffordshire and Salop, we believe it in theory, and hope that before long large property owners, or a higher source, will practically settle the question by sinking in the most convenient spot between the two districts.

The following sections give particulars as to the coals; their thickness and depth in different parts of the field. (See plate.)

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